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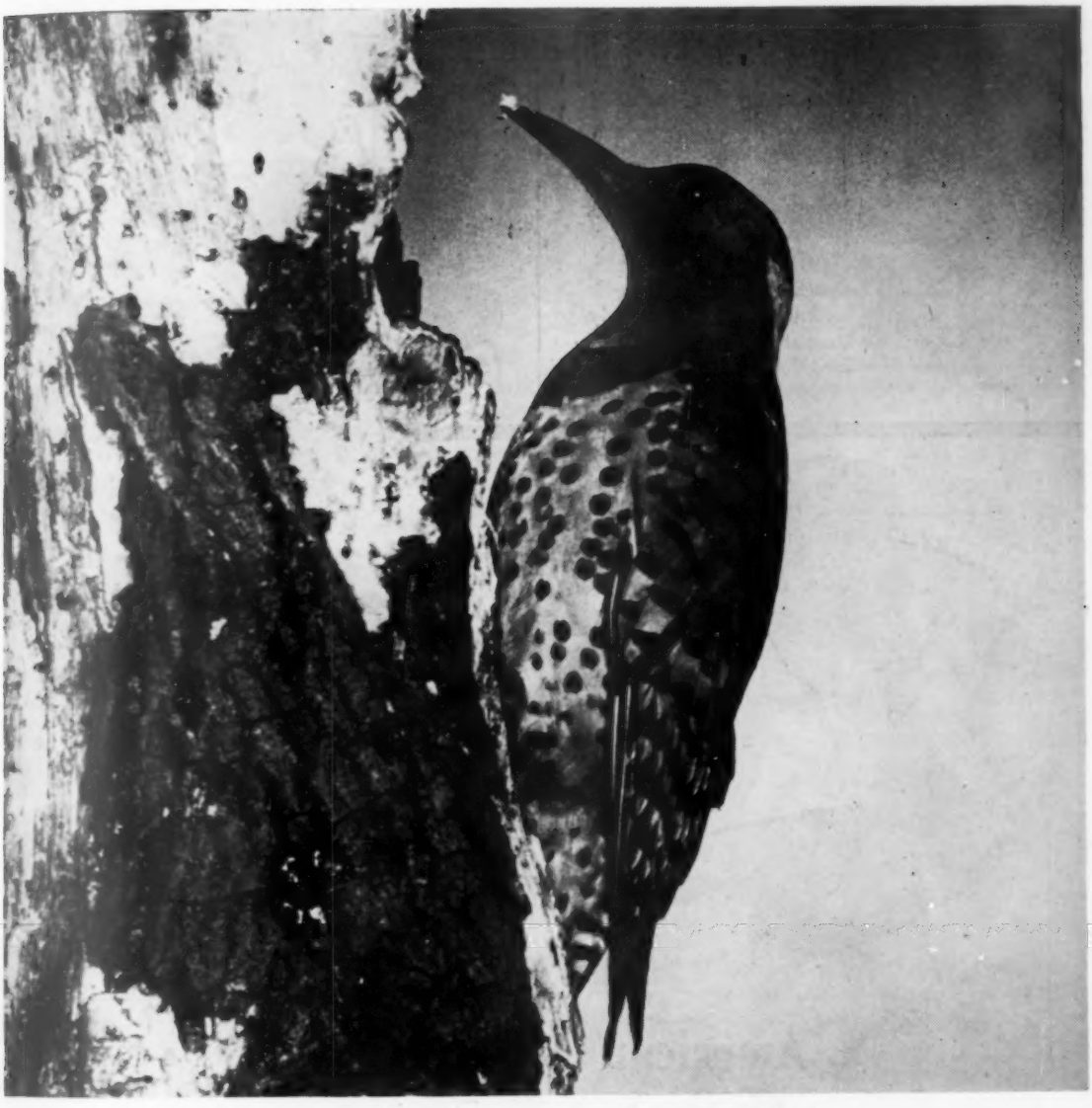
The American Biology Teacher

NOVEMBER, 1956 VOL. 18, No. 7



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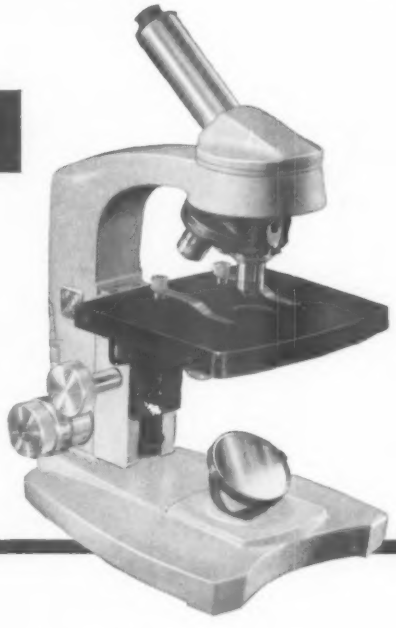

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Cover Photograph

Yellow Shafted Flicker, male, a member of the woodpecker family. Has a long, sticky tongue which it uses to collect its favorite food—ants. Range east of the Rockies from the limit of trees in Canada, south to Florida and Gulf of Mexico; winters north to Great Lakes and southern New England. Photograph by John Stemen, Goshen, Indiana, who is field auditor for the State of Indiana and enjoys nature photography as an avocation.

THE AMERICAN BIOLOGY TEACHER

Publication of the National Association of Biology Teachers.

Issued monthly during the school year from October to May. Entered as second class matter October 20, 1954, at the post office at Danville, Ill., under the Act of March 3, 1879.

Publication Office—Interstate Press, 19 N. Jackson St., Danville, Ill.

Co-Editors—RICHARD ARMACOST, Department of Biological Sciences, Purdue University, West Lafayette, Ind.; PAUL KLINGE, Howe High School, Indianapolis 1, Ind.

The Purdue University address will be the official editorial office. Manuscripts and all publication material may be sent to either of the Co-Editors.

Managing Editor—MURIEL BEUSCHLEIN, 6431 S. Richmond, Chicago 29, Ill.

Subscriptions, renewals, and notices of change of address should be sent to the Secretary-Treasurer, PAUL WEBSTER, Bryan City Schools, Bryan, Ohio. Correspondence concerning advertising should be sent to the Managing Editor.

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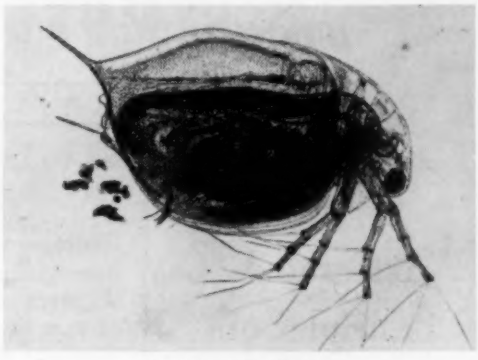

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Progress Report of the Implementation of Recommendations of the Southeastern Conference on Biology Teaching

A digest of the presentations of panel members

By RICHARD R. ARMACOST
Purdue University

Seventh Joint Conference, of the Science Teaching Societies
A.A.A.S. Meeting December 27-30, 1955
Atlanta, Georgia

MODERATOR: George W. Jeffers, Longwood College, Farmville, Virginia.

ALABAMA. *Father P. H. Yancey*, S.J., Spring Hill College.

There has been no formal meeting of the participants from Alabama who attended the Southeastern Conference. The recommendations are expected to be discussed at the next meeting of the Alabama Academy of Science. The many troubles present in the Alabama schools at this time have kept attention focused on other matters.

FLORIDA. *W. Hugh Stickler*, Florida State University. (Report by letter)

"Last spring Malvina Trussell, Sam Meyer, and I had an appointment with appropriate individuals in the Florida State Department of Education. Chief among these people was Dr. J. T. Kelley, Director of the Division of Teacher Education, Certification, and Accreditation. We got a very cordial reception. Dr. Kelley told us that he would be glad to lay the matter before the Teacher Education Advisory Council, the policy-making body for certification and accreditation of teachers in the State of Florida.

"Our original letter went to the State Department on March 21. Our Conference occurred a few days later. The entire matter was presented to the TEAC on May 5 at its meeting in Daytona Beach. According to a letter from Dr. Kelley, 'it was referred to the committee that deals with special certification problems, and I am sure as the committee works along that you will be called on to be of assistance.'

"I talked with Dr. Kelley again this morning. He assures me that our recommendation 'is in the mill.' He assured me again that our delegation will be requested to meet with the Council late next spring."

GEORGIA. *W. B. Baker*, Emory University.

Participants in the Southeastern Conference on Biology Teaching came back to Georgia and found the State Department of Education "all ready to go" and most cooperative. They have met several times with State Department representatives on the State Planning Council, which is composed of representatives of all State schools. The curriculum for the high schools has been completely restudied and revised. Two points discussed at the Southeastern Conference helped serve as a basis for revision: (1) the characteristics of growth and development of young people are concerned in any curriculum revision; (2) the science program should be directed toward conservation and utilization with emphasis on scientific methods and attitudes.

Specific recommendations for Georgia included:

(1) there should be at least one unit of biology in grades 7 and 8,
(2) general science should be given in grade 9,
(3) in grades 10, 11, and 12 it is strongly recommended that there should be a required course in human biology with rich electives in chemistry, physics, and biology as well as other sciences.

A major problem present is that there are more biology courses in the State than there are certified biology teachers. An evaluation of programs for training biology teachers is

under way. A committee is recommending that 54 hours of science be required for a science major, including at least 20 hours in one area.

KENTUCKY. *W. B. Owsley*, Morehead State College.

In the Fall of 1954, Kentucky participants in the Southeastern Conference on Biology Teaching met with the State Superintendent of Public Instruction to set up a similar conference on the State level. It was decided that since most teachers in Kentucky have to teach science courses other than biology, all science teachers should be invited to the State Workshop. College teachers as well as high school and college administrators were also included.

Later a committee of three participants from the Southeastern Conference met with the State Council on Higher Education, composed of representatives from the teacher training colleges and university, and outlined the main benefits obtained from the Southeastern Conference and presented plans for a State Science Education Workshop. The Council approved the plans and voted to give this planning committee a grant to cover expenses of the participants in a State Workshop.

The First Kentucky Science Education Workshop was held at the University of Kentucky August 8-11, 1955, with approximately fifty participants. The purpose of the Workshop was to study methods of improvement of science teaching particularly at the secondary level and to determine methods of interesting more students in science and scientific professions especially the teaching profession. There were no consultant specialists, but otherwise the meeting was similar to the Southeastern Conference.

Major recommendations from the Kentucky Science Education Workshop were:

(1) a teacher preparation program for teaching the high school sciences be patterned after the recommendations of the Southeastern Conference,

(2) serious consideration be given to requiring two years of science for high school graduation—a course in biological science and a course in physical science,

(3) a state-wide organization of science teachers be set up. The first meeting of this group will be in April, 1956.

(4) that "we can best interest others in science by becoming better teachers ourselves."

LOUISIANA. *W. G. Erwin*, Northwestern State College.

The Southeastern Conference Participants met with the State Supervisor of High School Instruction in October, 1954, to discuss recommendations of the Conference. The State Department of Education mimeographed Part III, Section A, of the Conference Proceedings, ("The Public School Program") and sent it out to the science teachers of Louisiana. Largely through the efforts of J. W. Lee, Head of the Department of Biology at Louisiana Southern University, the Conference recommendations have been presented to and discussed with many Negro science teachers in the State. This has been accomplished through the Louisiana Institute of Sciences and its Newsletter and the Louisiana Educational Association. Many of the topics are now being discussed at district meetings over the State.

A report of the Southeastern Conference was presented by W. G. Erwin at the 1954 meeting of the Louisiana Institution Association. The Biology section of the Louisiana Academy of Sciences heard a summary of the Conference and discussed its recommendations. A committee has been appointed by this organization to study the qualifications of Louisiana science teachers and present recommendations to the State Department of Education. This group also recommended to the State Department that they seriously consider the appointment of a State Supervisor of Science.

Interest in science fairs has grown rapidly as the result of the conclusions reached at the Southeastern Conference. The State Junior Academy of Science sponsored nine regional science fairs last year and a State Fair.

A special workshop for biology teachers was held last summer at Louisiana University. Three weeks were spent on the campus reviewing basic fundamentals of biological phenomena. An additional three weeks were spent at the Marine laboratory, Grand Isle Station. Dr. Harry Bennett, Director of the Station, came to the A.I.B.S. meeting at which the Southeastern Conference recommendations were summarized and was so impressed that he became a leader in the above program.

MISSISSIPPI. *R. L. Caylor*, Delta State College.

The six participants from Mississippi in the Southeastern Conference returned home with a determination to double their efforts to help improve biology teaching.

The initial effort of the Mississippi group came with a conference held at Delta State College. This conference, sponsored by the Oak Ridge Institute of Nuclear Studies, was devoted to the discovery of science talent and was attended by representatives from six states. The state academies of science were asked to sponsor a South-wide effort to recruit science talent through the medium of Science Fairs. The Mississippi Academy began work on this project and organized the State into seven districts, each district's Science Fair program sponsored by an educational institution. Teams were sent from the educational institutions into the counties to encourage Science Fair participation. The science section of the Mississippi Education Association emphasized Science Fairs at their State meeting. Chambers of Commerce took the lead in organizing and advertising local fairs. There were more than 1500 participants in district fairs. The State Fair was held as part of the State Science Academy meeting and more than one hundred and thirty district winners participated. More than five thousand dollars in prizes and scholarships were distributed at the State and district level. These funds were raised from industry. Their representatives, some of whom served as judges, were so impressed that they *asked* the privilege of sponsoring the fairs again in 1956.

There were eight scholarships given at the state fair. Other results are: We have the largest number of entrants in national competition in history, several counties have already made all plans for the 1956 competition.

These activities were reflected during the summer by trips to Washington for some. Others had the privilege of spending time at Oak Ridge, still others were in summer school within the state. Some of the institutions had specially planned programs for the science teacher. The Gulf Coast Research Laboratory offered courses in Elementary Science and High School Biology Methods. A feature of the high school course was an invitation for high school teachers and students from over the state to spend a week at the Laboratory. Twenty-five teachers and students took advantage of this opportunity. They participated in the class discussions, planned and exhibited a project of their choice, and made collections of Marine life. These collections were preserved and placed in their museum collections. The reaction from the group has been very stimulating. They were inspired to continue their projects. Reports indicate that they have been an inspiration to others in their communities.

1. *State level*:

I quote a representative of the State Department of Education; "I am convinced that the conference was thought provoking; it contributed understanding of the problems of others engaged in science. Participation in state fairs should come from the state level. In general more attention should be given to science teaching and the science teacher."

2. *State Educational Institutions*:

Curriculums in all Educational Institutions engaged in the training of teachers have been studied and improved. The sciences have received special consideration. The University has recently inaugurated a new Graduate Degree especially for science teachers. Other institutions have given attention to the science curriculum. The science faculties of all institutions have been encouraged to attend and participate in conferences where science improvement was concerned. The practice teaching program for the cadet teacher has been completely revamped. Summer programs are being planned for science teachers.

The average science teacher has been touched by the influence of the science fairs, the summer programs and the added enthusiasm of the students. My own department has been called upon for information by students and teachers inservice more than usual. These requests come largely from the more remote schools rather than the larger schools where the enthusiasm usually resides.

High school principals have studied the science programs more critically. The high school teacher has been made to feel that his position is more than an adjunct to the coaching of football or some other phase of athletics.

In others they have been replaced by better trained science teachers.

Finally, College enrollment is on the increase. The sciences are enjoying a large share of this increase. The emphasis on medical, engineering, nursing, and other preprofessional training has discovered a new crop of scientists. Many of these are turning to teaching. The recognition by industry, the Philanthropic organizations, and the awakening of the general public have inspired the teaching profession to look for better days.

NORTH CAROLINA. *F. Ray Derrick*, Appalachian State Teachers College.

On their return home all participants from North Carolina evaluated the Southeastern Conference. They were unanimous in their feeling that the Conference was very successful and had contributed a great deal to their personal growth. They also agreed that although the recommendations were not spectacular, they were sound and represented an important base from which biology teaching can be improved.

The Conference resulted in a greater appreciation of the high school teachers' problems as well as in an awareness of the many possibilities to improve biology teaching. It was particularly evident that far greater cooperation between scientists and science educators, if you can separate the two, is needed. Understanding each other's problems, if nothing else, is a great aid in teacher training.

The Southeastern Conference Report has been widely circulated throughout the State. In the secondary schools, the Report has been discussed at teachers meetings. In institutions of higher learning, departmental meetings of botany, zoology and biology departments have been devoted to the discussion of the recommendation in the Report. There have been joint meetings between departments of botany, zoology, biology—and education in a number of institutions. These were stimulated by the Report and have been attempts to outline procedures for better cooperation and understanding.

Modification in some college curriculums, which had been started before the Conference, gained momentum. Courses to fit the needs of the teacher have been put into many college programs.

There has been the best of cooperation from the State Department of Education.

SOUTH CAROLINA. *Harry W. Freeman*, University of South Carolina.

The entire South Carolina team of participants who attended the Southeastern Conference were contacted and contributed to this report. The general reaction of this group was that:

(1) the conference techniques were excellent,
(2) the leadership was excellent,
(3) some committee reports were assembled too hastily, but this difficulty was removed in the final report,
(4) a great deal of personal growth was evident in the participants who developed new interests, renewed old interests and were stimulated to go back home and work on the development of biology teaching.

One of the greatest rewards of the Conference was greater understanding developed between groups with somewhat diverse opinions, and the opportunity to discuss common problems with participants from other states.

On returning to South Carolina a meeting was held with the Staff of the State Department of Education, including their field representatives, to study the effectiveness of science teaching in the high schools in the hope of changing the overall program. This meeting was held at the University of South Carolina and had as its major theme a study of the ways South Carolina can develop a more adequate science program and provide incentive for students to go into science as a life's work.

Beginning January 1956, the study of the science program will officially be given priority over all other State Department Studies.

The State Academy of Science has accepted a plan whereby their group will sponsor the Science Fairs. Three regional and one State Science Fair are now being held each year. The Biology Department of the University of South Carolina has opened its doors to students and teachers of the high schools, who are constantly visiting displays set up for them.

Members of our graduate faculty have already met several times with members of the Department of Education to begin working on a sound and feasible program whereby graduate students who wish to be biology teachers may take more courses in biology on the graduate and undergraduate level to better

qualify them as teachers. Plans are being made to encourage more prospective teachers to major in biology and to receive enough courses in Education to certify them as teachers.

Two weeks ago, the University of South Carolina sent a check to the National Research Council for enough copies of "Career Opportunities in Biology" to be distributed to every high school biology teacher in the State. The South Carolina Academy of Science has appointed a committee to make a survey on science teaching in South Carolina. Many of the things outlined above are results of the Southeastern Conference on Biology Teaching.

TENNESSEE. *W. W. Wyatt*, University of Tennessee.

The Report of the Southeastern Conference has been distributed to teachers through the various teachers associations. The recommendations in the Report have been used to upgrade the certification recommendations of the various teacher education institutions in the State.

The University of Tennessee has made the following recommendations for the training of biology and general science teachers which will come up for approval in April, 1956. It is hoped that this may serve as a pattern for many teacher education institutions in the State.

	Quarter Hours
Botany	20
Zoology	12
Physics	12
Chemistry	12
Geology	7
Physiology	8
Mathematics	9
Bacteriology	4
Total quarter hours	88

This is an increase of 16 quarter hours over the previous minimum in the sciences. The hours in Education have been increased from 36 to 37 quarter hours. In keeping with the Southeastern Conference recommendation for a greater emphasis on the humanities in the education of a teacher, the overall graduation requirements have been increased from 192 to 205 quarter hours.

VIRGINIA. *George W. Jeffers*, Longwood College.

The following are evidences that the problem of better science teaching is being attacked in Virginia. It is difficult to designate which are direct outcomes of the Southeastern Conference, as it would be equally difficult to indicate that the Conference had little or nothing to do with them.

Item 1. A report of the Southeastern Conference was made to the Science Section of the Virginia Education Association in October, 1954. At that time, this body of science teachers was in a moribund condition, but one year later, October, 1955, this same Science Section suddenly came to life. New officers were elected, a new constitution is now being drafted, a science newsletter is in the offing, and a new type of program planned. The outlook was never brighter for this body of public school science teachers' becoming an "action group," and for its joining forces with the Science Teachers Section of the Virginia Academy of Science. This alone is reason for encouragement.

Item 2. Next, the results of the Southeastern Conference were presented to the Long Range Planning Committee of The State Academy of Science. As was to be expected, this group responded vigorously, due, in great measure to the presence of a scientist from the University of Virginia who had been on loan to the National Science Foundation and who was equally conversant with the activities of the Scientific Manpower Commission. First, the Long Range Committee appointed a strong delegation of non-biologists to support us in our proposed meeting with the State Department of Education (see below). Secondly, the Long Range Committee presented the whole subject of science teaching to the Academy Council. The latter thereupon set up an *ad hoc* committee, to function until the annual meeting at which time a permanent Advisory Panel on Science Education was established.

Virginia science was fortunate in having a member of this panel as the Academy delegate to the Virginia Conference on Education and as one of the delegates to represent the State at the White House Conference on Education. Two items of the composite report of the Virginia Conference are worthy of men-

tion as indicating an increased emphasis on the teaching of science and mathematics. They are: "Schools should increase emphasis upon the teaching of science and mathematics"; and, "Schools should recognize some danger in the indefinite expansion of course offerings."

Item 3. In February, 1955, we were accorded a very receptive hearing by the State Department of Education. Not only were we confronted by the State Superintendent himself but, I believe, by every one of his major lieutenants as well. Copies of the Southeastern Conference Report were distributed and freely discussed. No commitments were made and none were asked for. However, I am happy to be able to report that during the past summer a ten-day workshop on the teaching of science was sponsored by the State Department. This workshop group was concerned with the improvement of textbooks and other devices for science teaching.

Item 4. At this Atlanta meeting you will hear much about STIP, the Science Teaching Improvement Program. Dr. John Mayor who is responsible for this program can, for example, tell more about Dr. John Coleman and his work in northern Virginia. Dr. Coleman has done a great deal to enlist citizens in encouraging teachers to maintain a high standard of excellence in the teaching of science and mathematics.

But this interest is not confined to this one region of the State. For example, recently my own institution was approached with the idea of our sending someone to assist a group in the Norfolk area. Here they seem to be concerned over the science preparation of students for college. And there are others that have taken steps to improve the quality of science and mathematics and that have indicated a desire to work cooperatively with those who teach the subject sciences in the colleges. If all of these activities were going on a year or so ago, I was not aware of them.

Item 5. Still another "straw in the wind" comes from the University of Virginia. The President of that institution has set up an all-University committee to work in determining ways in which the University can be effective in improving the general education level in the state. All of our troubles are certainly not at the secondary level. Indeed, as was brought out at Gainesville, it might well be that developing an awareness of the needs of the secondary schools on the part of those teaching the various subjects in the college could be the biggest problem we have.

Item 6. I have not spoken of most of the types of publicity given the Southeastern Conference in Virginia. One avenue only will be mentioned because of its potentialities. I refer to such organizations as the service clubs. Those of you who were at Gainesville will remember Percy Warren. Well, among his other distinctions, Percy is this year Governor of one of the Districts of Rotary International. Just now Governor Percy is striving to find room on the program of his District Conference next spring for a speaker to present the science shortage situation to this representative group of business and professional men.

From all of the above I personally feel that more and more of our educators and citizens are becoming concerned over the quality of science teaching and the urgent need for additional qualified te .: ers.

Waste Areas Used

Vast areas of waste land in the United States and throughout the world can be harnessed for food production through the use of small amounts of chemicals. So potent are these chemicals—called trace elements—that a few ounces can transform several worthless acres into valuable farm land, declares Dr. Charles H. Kline of the Climax Molybdenum Company, New York.

Farmers in Australia and New Zealand already have obtained "spectacular improvements" in the productivity of marginal lands through applications of minute quantities of such trace elements as molybdenum, copper, zinc and manganese, reports Dr. Kline, who toured these countries to study the soil fertility projects. He cites the famous Ninety-Mile Desert on the border of South Australia and Victoria, which had been regarded as virtually useless for years. Twenty acres of this land provided barely enough food for one sheep. Today, after treatment with traces of copper and zinc compounds, the land can support two ewes per acre, he asserts. The name of this former desert is now Coonalpyn Downs and a new ranch is set up there every two weeks.

Books for Biologists[1]

THE YOUNG SCIENTIST, Martland P. Simmons, 164 pp., $3.00, Exposition Press, New York, New York.

Here is a science activity text that fills a long-felt need for a book that will challenge the student's initiative and stimulate his scientific imagination. It is designed to give students a thorough grasp of the key principles of natural science through meaningful laboratory activity and thought provoking questions and study projects. The factual content is scientifically accurate, its discussions illuminate natural and technical processes familiar to students in their daily lives, and its illustrations are clear, complete and adequately labeled. The equipment is minimal, and of the kind usually available in the school laboratory.

PLANT PHYSIOLOGY, B. S. Meyer and D. B. Anderson, 784 pp., $8.50, D. Van Nostrand Company, Inc., Princeton, New Jersey, 1955.

A discussion of the fundamental facts and principles of plant physiology with a reasoned evaluation of the data available rather than a mass of undigested facts and contradictory interpretations. Most of the discussion is based directly on data selected from the original literature. Most chapters have appended a list of discussion questions. A laboratory manual ($3.50) is available to help develop, by experimentation, many of the ideas presented.

DISPLAY FOR LEARNING, Marjorie East, 306 pp., Dryden Press, New York, New York.

The use of visual aids in teaching has become so thoroughly accepted, no teacher or prospective teacher needs to be persuaded that "seeing expedites learning." This book is aimed at showing as specifically and clearly as possible how to produce visual materials and how to use them in and out of the classroom. The two key points brought out are visual materials do not require a large budget, and that the teacher's artistic skill or talent is less important than his common sense.

LIVES OF GAME ANIMALS, Ernest T. Seton, 949 pp., Charles T. Branford Company, Boston, 1953, Vol. 4, Part 2.

This book consists of full descriptions of many of the land animals in America, north of the Mexican border, which are considered "game," either because they have held the attention of the sportsman or received the protection of law. The author presents a complete and colorful picture of each animal, its distribution, and every phase of his life habits. It is an excellent reference book containing interesting diagrams and illustrations as well as a thorough and accurate information.

GENERAL BIOLOGY, Gordon Alexander, 881 pp., Thomas Y. Crowell Company, New York, New York, 1956.

This text book is sufficiently comprehensive to meet the needs of all three types of students usually found in general biology classes. Those who plan to major in biology, botany, or zoology; those who are preparing for further study in medicine or agriculture; and those for whom this is a terminal course as part of their general education program. It includes all major aspects of biology, providing adequate material for a thorough full-year course.

TEACHERS' GUIDE FOR CONSERVATION AND NATURE STUDY, Stanley B. Mulaik and Rebecca Snow, 171 pp., Extension Division (Stanley Mulaik), University of Utah, 1955.

This is a report of committee work in a Natural History Workshop. Many "down to earth" activities are described with illustrations under such topics as: geology and topography; weather and climate; soil conservation; water conservation; desert plants of Utah; animals and their relationships to plants and soil. An introductory chapter presents "Nature Study and Conservation in Relation to the Whole School Program."

PERSONAL AND COMMUNITY HEALTH, C. E. Turner, 660 pp., $4.75, The C. V. Mosby Company, St. Louis, Missouri, 1956.

This book, planned for the various college-level groups, presents personal and community health information with enough underlying science to clarify and support the health teaching. The book is rich in illustrations. The discussion of normal function presents those facts which are needed in order to know what to expect from the body and how to take care of it.

SCHOOL HEALTH PRACTICE, C. L. Anderson, 560 pp., $4.75, The C. V. Mosby Company, St. Louis, Missouri, 1956.

Health promotion is a recognized component present-day public school education. The *what*, the *how* and the *why* of the functional school health program is the substance of this publication. Special attention is given to the practical considerations of everyday school life. Because the child is the concern of all school health work, attention is given to an understanding of normal child growth, development and health. Common departures from health are introduced to enable

(Continued on Page 233)

[1]The art for the above heading was contributed by Ray Eno, 461 Eighth Avenue, New York 1, N. Y.

Some Trends in the Use of Audio-Visual Aids in Biology Teaching[1]

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As we begin a new year, we can see the signs of the times reflected in a multitude of technological advances. None of us in the biological science teaching field can fail to recognize the impact made in recent years by the great advances in audio-visual materials and equipment. We speak glibly of cinemaphotography, photomicrography, time-lapse and phase-contrast techniques, and of other marvels, and we are using many of the products of this technology to augment our biology teaching in the classroom. And yet, with all of the specialized tools of audio-visual education at our disposal, I wonder just how skilled *we* are in their selection and utilization for the most effective teaching. A short time ago, I read in our local newspaper of a midwestern farmer who needed snapshots taken of his prize Angus cattle, so that they could be registered. Borrowing a camera, and looking it over with the practiced eye of a man who knows his cows, he used up three rolls of film speedily, and sent them in for processing. When the prints were returned to him, he complained that there must have been a mixup in orders, for these weren't his cattle at all. Then he noticed that all 24 pictures were of his own face, taken as he held the camera in reverse position.

I think it is fortunate for us that some of our errors in using modern audio-visual techniques and devices are not publicized to the same extent. After all, the usual concept of audio-visual aids is restricted to films, filmstrips and slides,— leaving out the models, charts, classroom demonstration, field experiences, individual laboratory experiences, and other facets of a balanced and effective preparation in biology. Consequently, in speaking of trends in the use of audio-visual aids in teaching biology, we should accept the fact that all of these experiential facets are as truly audio-visual as the film materials so commonly recognized. We also should admit that there have been some alarming tendencies by teachers to substitute audio-visual aids for real teaching, whereas these aids should be kept in their role of supplementary materials and techniques designed to be helpful when and as needed. Every part of a biology course has one or more "ideal" methods of preparation for maximum effectiveness, and it is our job to study each of these parts carefully, along with the various audio-visual aids at our disposal, to determine just how we should go about the business of teaching it.

A most illuminating study of the changing picture of audio-visual education was released a few weeks ago by the National Education Association. In the NEA *Research Bulletin* for October 1955, entitled "Audio-Visual Education in Urban School Systems, 1953-54," many points of comparison were made between 1954 and 1946, when a similar survey was reported. It noted that, between 1946 and 1954, in 1310 urban school districts representing population groups of from 2500 to several million persons,

1. The number of districts having audio-visual education departments increased from 16% to 27%.
2. The number of slide and filmstrip projectors has tripled, so that now there are 36 for every 10,000 pupils; the number of sound projectors (and also radio receivers) has doubled, so that there now are 24 for every 10,000 pupils.
3. For every disc recording available in 1946, there were almost two in 1954 (498 for every 10,000 pupils); for every sound film title then, there was three in 1954 (566 for every 10,000 pupils); and every filmstrip title then, there were *four* in 1954 (800 for every 10,000 pupils).
4. The number of secondary school teachers who never use educational films dropped from

[1]Presented at the National Association of Biology Teachers Meeting at Atlanta, Ga., December 29, 1955.

Field trips are audio-visual aids, too!

Biology teaching on television.
(Photo by Robert W. Rounds)

40% to 19%, while the number who used films "frequently" (at least once each week) remained at 24%. In elementary schools, the "never's" dropped from 35% to 11%, while the "frequently's" climbed to 35%.

Some other facts noted in this study showed that:

1. Among audio-visual directors who have other major school duties, science teaching was the assignment of 27%, the highest percentage.
2. Science ranked at the top of curriculum areas in which secondary school teachers were making the most effective use of audio-visual aids.
3. Major handicaps to better utilization of A-V materials were, in this order: lack of interest on the part of classroom teachers; difficulty in obtaining sufficient funds for A-V setups; lack of a central coordinating agency within the district; lack of adequately trained A-V leaders.
4. Classroom teachers who were not interested in using A-V materials gave these reasons for their attitude: adaptable instruction space was not available at appropriate times; they were not qualified to use A-V materials; materials and equipment were not available when they would have been used most effectively; and, equipment was too cumbersome.

Now, with this survey's findings as a background, what are the experiences of biology teachers? To help obtain information on the use of audio-visual aids in biology teaching, sets of questions were answered last fall by about one hundred fifty biology teachers and audio-visual suppliers. Within the past few years, we have increased our use of A-V materials significantly. This is explained partly by the fact that we have more equipment at our disposal; partly because we have come to recognize these aids as valuable accessories to our teaching; partly because the quality and quantity of the materials have increased. Many of us, I fear, are still in the throes of "move fever,"—a dread disease in which one symptom is a temporary loss of effective teaching skill. However, among those who contracted this disease some time ago, and among those having mild cases, there is very encouraging evidence of better selection and utilization of classroom films. While some schools have turned to films as substitutes for laboratory and field experiences, others have learned to select film materials which help to explain the more difficult or unattainable experiences, at the same time retaining and even expanding the individual laboratory experiences of biology students. There have been tales that charts, models and other "old stand-bys" have lost out to newer materials; however, except for the displacement of the old lantern slide by the convenient 2x2 transparency, sales figures from leading biological supply houses dispute such tales. Biology teachers have been expanding their teaching horizons, in that they are using a greater variety of aids, including tape recorders, plastic mounts, flannelboards, preserved and living materials, models, charts, filmstrips, slides, recordings, films, and direct experiences with microscopes and similar items which afford individual student use. In fact, the development of unbreakable models, plastic mounts, and the two by two-inch transparency has done much to make biology more meaningful to students. The low cost of the slide-filmstrip projector, and the storage

convenience of the 2x2 slide and the once-despised filmstrip have brought audio-visual teaching into many classrooms in which high cost had previously hindered its entrance.

Even with this sketchy picture, we can readily see that biology teachers are taking advantage of the aids currently available. As might be expected, film materials remain in the forefront of the aids in greatest use. There is recognition of the improved quality and variety of these materials, with the most remarkable changes noted in filmstrips, with their excellent use of color, their fewer wasted frames, their adaptability, and their rapidly improving coverage of topics. Some filmstrips now are available with sound commentary, through the medium of magnetic tape or recordings. There is some danger of excessive art work in some, just as there has been some unrealistic animation in a few films. One of the newer developments has been the filmstrip series, some of which have been planned to augment a regular high school or college biology course in its entirety. Other series have been developed to illustrate certain textbooks. That this is true of elementary science as well as of college texts is pointed up in the recent release of the first three of a promising series of films to accompany one of the elementary science textbook series. Several producers have stepped up their production schedules considerably for forthcoming filmstrips in biology, particularly at secondary school and college levels. Good materials in botany are scarce, particularly in life cycles and genetics; other gaps exist in lower plant groups, ecology, the invertebrates, and human physiology. Because of the lower cost to both producer and user, filmstrips in the more specialized areas of biology should be developed as rapidly as the needs become known to producers.

In general, teachers have approved of the changes in biology films. At the same time, however, a number have noted that the newest films are technically excellent, but that there has been little improvement in them as teaching devices—that the elements of a good lesson simply aren't there. Unscientific statements, poor sequences, and questionable selection of illustrative material continue to creep in, contributing toward misconceptions and altered points of view. One of the perennial complaints, however, is that producers, for economic reasons, design films which will hold some value for a wide range of age groups. Consequently, many films are too diluted for high school and college use, and they cover too many topical units for one thorough classroom lesson. One of the noteworthy exceptions to this tendency has been the production of phase-contrast films (Arthur Brice, Phase Films, Ross, California), which enable students to see functioning activities of transparent living forms in unstained condition. The addition of the camera to the Nobel Prize winning technique of phase-contrast microscopy has brought the advantages of this unique process to large audiences. However, because of the limited sale of these films, it takes up to eight years for production costs to be balanced, and so, further activity in this field probably will be restricted, while biology teachers ask in vain for more of this type of mature, single-purpose film. Indiana University and the National Film Board of Canada have ventured into the limited-use field with commendable releases on meiosis and mitosis, sexual and asexual reproduction, and the embryonic development of the chick. Other developments in films deserving attention include greatly improved techniques in time-lapse photography, and experimentation with different lengths of films. Film loops and six-minute films now are available, and appear to be proving very effective for particular teaching situations. Free-rental films generally are much better in quality, and contain a minimum of objectionable advertising, as compared with their forerunners. With all of this, however, teachers still are looking for better correlation of written text materials and film releases, for more realistic grade-placement, for summary and question techniques, for less distracting music, and for improved teaching guides. A study underway at Montana State University concerns the relative effectiveness of science teaching with and without the use of films, and also with films as replacements for textbooks. Here is the place for the "perfect" teaching film.

It has been said that biology has been one of the last subjects to receive attention from film producers, and that the present heterogeneous and overlapping accumulation of titles reflects the manner whereby producers

searched for a market. If that is the case, it should also be said that we biology teachers have not helped producers become aware of the gaps in available film subjects. When was the last time *you* wrote a film producer or your Audio-Visual Committee of gaps in film subjects? Botanical films are needed, particularly in life cycles, physiology, hormones and genetics. Embryology, heredity, evolution, decaying processes, invertebrates, and the effects of ionization on protoplasm should suggest other topics still inadequately filmed–and how many of the numerous bird films cover bird physiology? Life history releases on insects and other invertebrates are coming out currently, and still more are needed. A number of teachers have asked for inspirational films on the careers of successful biologists, and we have seen a few such releases this year. There has even been a suggestion that the Disney studios produce "The Dance of the Molecules," and the story of how these molecules manage to get through membranes! As mentioned earlier, there are rumblings of discontent because so few films will challenge college biology students. And then, there is the problem of the outdated, excessively long film. Producers gradually are re-editing and modernizing the ones which have proven basically sound, spurred on to some extent by their use on television.

Slide transparencies in the 2x2 size have almost completely replaced by 3¼" x 4" lantern slide of days gone by. The quality of their color values, ease of storage, and low cost of projection equipment have helped this transition. The market is alive with thousands of slide selections in biology, but many biology teachers have concentrated on making their own slides, for these latter have the advantages of a local, familiar setting (when desired), and of being produced for a particular teaching purpose. Numerous schools and colleges furnish film and photographic equipment, enabling biology teachers to produce their own slides with minimum expense. Of course, slides of highly specialized subjects, or involving expensive techniques, continue to be the province of supply houses. The use of color transparencies of microscopic preparations is an opportunity overlooked by many teachers, according to one supplier. With these aids, we can preview laboratory exercises with an entire class, or use them for quiz purposes. Very possibly, the increased use of microprojectors has had an effect on this situation, for the initial cost of a microprojector is no more than that of a good slide projector.

But the 2x2 slide revolution points up another movement–the expansion of the "do-it-yourself" idea in the audio-visual field. Teachers are experimenting with other things besides the slide transparency. Some convert filmstrips into 2x2 slides; others produce their own films and filmstrips. There is an increasing tendency for teachers to make their own charts and models, for some find it easier to interpret their own products than the commercially-produced items. Further, the recent improvements in tape recording equipment have led to wider use. Now, teachers are taping heartbeats; the natural animal sounds of their own localities; well-planned discussions on health topics and lives of great scientists; and class discussions on biological topics, which are played back to check on weak aspects of students' scientific reasoning. Recordings of bird and other animal sounds are accompanied by a showing of color slides of the animals and their habitats. One major university plans to stimulate the production of inexpensive teaching aids with a film series on the preparation of transparencies, materials for opaque projectors, bulletin board material, lettering, simple framing, tape recording, and other materials.

In spite of this emphasis on locally-produced materials, audio-visual producers and biological supply houses are reporting record sales in biological materials. One of the largest suppliers notes that enlarged models of various kinds are being used more commonly than was the case ten years ago; that display and demonstration specimens in glass jars and glass-topped cases continue in good demand; and that specimens embedded in clear plastic (which were unknown only ten years ago) are in tremendous demand. The plastic mounts are proving excellent investments, high in initial cost, but even higher in durability and teaching value. Since so many are purchased by city school systems, there are indications that they are stored in a central audio-visual library, and loaned out to numerous schools. Another encouraging development has been

the remarkable increase in numbers of microscopes, field glasses and similar items of equipment in schools and colleges. This is particularly true of the secondary schools—one major biological supply house reports a 500% increase in sales of student microscopes to secondary schools since 1950. There also has been a proportionate increase in volume of prepared microscopic slides, but most of these have been shipped to colleges. High school and college instructors back up this report on increased student equipment. While colleges want at least one microscope per student, most high schools seem to aim toward a microscope for every two students. Since we are teaching in a day when it is possible to dissect a frog or study its habitat without even seeing one in the flesh, by viewing films or turning acetate pages of books containing drawings of organs at various stages of dissection, it is gratifying to see the widespread increase in student biological equipment in so many schools. However, one major supplier observed that in a number of schools, science learning has come to be an increasingly vicarious experience, and that it is no wonder that those schools fail to interest student in science. He also observed that this dilution of science training is having its effect, in that some new schools have been constructed without any laboratories at all. Does this sound biased? I don't think so. One biology teacher recently wrote of decreased use of microscopes and other first-hand experiences, since he wasn't "training laboratory technicians, and the films do very well." It would seem that one valuable contribution could be made by audio-visual people (or committees) in undertaking a program of education in the proper selection and use of these teaching materials.

Radio and television continue to be considered as "extra-curricular" by most biology teachers, although there are frequent evidences of class utilization of some programs. Increasingly, however, schools and colleges are installing facilities for receiving and producing radio and television programs, and teachers are studying the offerings with a more critical eye. There are complaints of the lack of preprogram material and of the poor placement of educational programs in daily schedules. Few biology teachers, especially in high schools, are conducting programs for radio or television, although the tendency for radio stations to turn more and more to local activities instead of the network offerings has stimulated schools to prepare an increasing number of programs on a regular basis. Pioneering efforts in educational television in biology have produced numerous "interest" programs, and a few telecourses—plus a notable freshening and sharpening in teaching techniques. Grants, such as the recent one by the Ford Foundation, should stimulate more experimentation, and it is hoped that one outcome will be a technique for evaluating educational programs in terms of student growth. There are requests for more effective use of the problem-solving approach, for less dilution of material, for stories behind great medical discoveries, and for series of programs at several educational levels at the same hour and day each week. With increasing numbers of biology teachers being asked to conduct programs on television, there has developed a corresponding interest in the idea of a clearing house for script suggestions and techniques. The U. S. Department of Agriculture has been especially cooperative in this connection, by conducting television workshops, supplying written materials for guidance, and setting up a film loop library. Until some other group is set up to handle such a clearing house in the N.A.B.T., the Audio-Visual Committee can act in that capacity, and is open for business right now.

The scope of audio-visual aids in biology has expanded greatly—and so also have the aspirations and difficulties encountered by teachers. Why can't we have noiseless projection equipment, without sprockets, but with an automatic film-cleaning attachment and an automatic shutoff when trouble develops? Isn't there some way that we can obtain films for showing at the exact time when they will be most effective in their use, instead of having to adjust our teaching schedule to coincide with a film rental date or projection equipment-use date made weeks or months in advance? Can't we modify our classrooms to the extent that we may show a few slides or a film loop without delaying the teaching sequence or timing for greatest effectiveness? Isn't there some way that all biology teachers can learn about the values and relative merits of all types of first-hand experiences and

audio-visual aids for a truly effective education in the biological sciences? Certainly, there *are* encouraging signs, and we are now seeing the development of projectors with built-in, brilliantly-lighted screens; of opaque projectors which can be used to show almost any flat or three-dimensional object in partly lighted rooms; of some film materials which must have been supervised by master teachers and biologists; and of enlightened teachers and administrators, who are planning facilities and training programs for enriched biology teaching. In the final analysis, the effective use of audio-visual aids in biology will be determined by the teacher, and we must develop skill in their development, selection and utilization just as carefully and imaginatively as is humanly possible.

National Association of Biology Teachers—Co-Sponsors Institute

INSTITUTE FOR TEACHERS OF HIGH SCHOOL BIOLOGY
INDIANA UNIVERSITY
June 25 - August 3, 1956

Left to right, first row: Dr. Shelby D. Gerking, Director; Miss Jane Post, Miss Mary Margaret Williams, Miss Helen Reed, Miss Davida Phillips, Miss Beatrice Flori, Miss Marilyn Bibb, Miss Ruth Dutro, Miss Jacqueline Wooden, secretary. Second row: Mr. Paul Klinge, Assistant Director; Mr. George Plumlee, Mr. Robert Shaffer, Mr. Jesse Davis, Mr. Merrill Carr, Mr. Eugene Edington, Mr. Robert Rowe, Mr. Ludwell Binkley. Third row: Mr. Russell Boring, Mr. Von Alexander, Mr. Raymond Lyons, Mr. Max Forsythe, Mr. Wilbur Alexander, Mr. Charles Peters, Mr. William Brown, Mr. Donald Baker. Fourth row: Mr. Edwin Steinkamp, Mr. Frank Bernhardt, Mr. M. Paul Dennison, Mr. Kinsey Windell, Mr. Wayne Easterday, Mr. Kenneth Bush, Mr. James Dawson, Mr. Phillip Fordyce.

A six-week Institute For Teachers of High School Biology which was held at Indiana University this summer had the NABT as the cooperating science organization. The National Science Foundation provided a grant for support of the Institute. Thirty teachers, chiefly from the Midwest, participated in a program arranged exclusively for biology teachers. Week-long periods were devoted to presentations on entomology, growth and development, plant physiology, ecology, bacteriology, and protozoology. There were lectures, laboratory sessions and field trips, special additional lectures and tours.

Free Will from the Biological Point of View

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A reaction in an animal may be defined as a change resulting from a stimulus. By definition a stimulus is the transference of energy in some form to a cell or cells of the reacting organism. It is obvious that stimuli may originate outside of the body or within the organism. A stimulus applied to a nerve ending initiates a physico-chemical wave (nerve impulse) which travels over the nerve fiber. A nerve impulse may serve as a stimulus of an impulse in a second nerve cell. The second impulse may reach an effector (muscle or gland) and produce a reaction; or it may travel to the brain, or from one part of the brain to another, inducing a mental reaction. One reaction may serve as a stimulus to a second reaction, and this in turn to a third, and so on indefinitely in chain-like fashion.

The particular path followed by a nerve impulse and the succession of nerve impulses through the maze of neurons of the brain depends upon the structure of the brain and the physiological state of the cells. Structure and physiological state both depend in turn upon heredity and the past experiences of the individual. Heredity is an epitome of the history of the organism throughout all preceding generations back to the origin of life.

As a product of growth and differentiation the cells of the brain are hooked up in complex intercommunicating pathways. New pathways are formed throughout life as a result of the stimulus-response mechanism. We thus come to possess the physical basis for a chain-reaction system of stimulus-response. Since the number of neurons in the human cortex is numbered in billions, an exceedingly large number of possible pathways is indicated.

Introspection tells us that sustained mental activity (thinking) is subjectively in the nature of a chain reaction system, where one idea serves as a stimulus for the next. We have no evidence that mental activity may take place in the absence of neuron activity, nor that neuron activity can take place without the release of energy, although the energy released in conjunction with a nerve impulse is extremely small compared to that released by a contracting muscle fiber. Much positive evidence points to a close correlation between mental activity and neuron activity. This evidence includes the behavioral effects of the destruction of a portion of the cortex; the effects of drugs, such as stimulants and narcotics; experimental stimulation of the exposed cortex during operations on the brain; experiments with the electroencephalograph; and pathological changes in the neurons associated with hereditary or environmentally induced mental disease.

The will, using *will* in the sense of the exercise of choice, depends upon the dominance of one stimulus or set of stimuli over others. When we say that we make a difficult choice we mean that the stimuli tending to initiate alternative or opposing reactions are nearly balanced. We make a choice, that is, we exercise the will, when we reach a decision that we are going to do a certain thing now or at some future time or when we decide not to do it, or when we decide that something is good or bad, true or untrue, and so on. The contemplated thing or act may be either mental or physical in nature. Not until we have acted, however, can we say that we have made an irrevocable choice, since some new stimulus may prevent or modify the action decided upon up to the moment of action. Only in retrospect therefore can we say that we have made a final choice. And in retrospect we can always see that our choice depended upon a stimulus or stimuli. Consequently our choices are not free, if by *free* we mean autonomous. And if by *free will* we mean

complete freedom of choice our wills are not free.

If the foregoing analysis is accepted, how are we to explain that freedom of choice, or free will, which probably everyone at times feels that he possesses? Perhaps no one claims that we have open to us an infinite array of choices, and probably all would agree that our possible choices are limited by our natures. Nevertheless, we do have a great range of choices, owing, so the biologist would say, to the multitude of stimuli that have affected us and our ancestors during our long evolutionary history, and to the complex pattern of the nervous system that has evolved.

The nervous system of an adult human being is, among other things, an immense storehouse of past messages (subjectively, memory). Among these are memories of our past choices. Past choices condition subsequent behavior. Memory permits us to look ahead in imagination; an imagined goal may thus serve as a stimulus to affect our choices. A knowledge of the stimulus-response mechanism in ourselves also increases the variety of our possible choices: knowing what responses to expect in ourselves from particular stimuli we are able to choose those stimuli that lead to the highest satisfaction. Men choose those objects and actions that promise the greatest satisfaction, either now or at some future time. We differ from animals in that we live less for the moment and more in the future. If we accept the premise that all of our choices are directly or indirectly responses to internal or external stimuli, and if by free will we mean the power of making choices uninfluenced by past events, or without the functioning of the nervous system, as some apparently do, I can find no evidence that free will as thus defined exists.

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Books for Biologists

(Continued from Page 225)

teachers to understand their proper role in contributing to the needs of the child who falls outside of the normal range.

INSECTS AND SPIDERS, C. P. Friedlander and D. A. Priest, 124 pp., $2.75, Philosophical Library, New York, New York, 1956.

This book is an attempt to present the classification of insects and spiders in a simple yet scientific manner, and thus foster the inclusion of these groups in the standard field-work projects of schools.

About a hundred families of insects and seventy genera of spiders are covered, and a feature of the keys, is the large number of line drawings used to illustrate the characteristics of the groups described. Any enthusiast should be able to use the book unaided, while teachers of "nature" and general science classes will find it useful in identifying the numerous specimens presented to them.

THE PRESERVATION OF NATURAL HISTORY SPECIMENS I, INVERTEBRATES, Reginald Wagstaffe and J. Hanelock Fidler, 205 pp., $10.00, Philosophical Library, Inc., New York 16, New York, 1955.

The techniques employed in the preservation of natural history specimens have been described in a diverse and scattered literature, often difficult of access to the reader. In the present volume up-to-date methods have been brought together which can be relied upon to demonstrate and preserve permanently the taxonomic characters of specimens from most groups of invertebrates.

ENCOURAGING SCIENTIFIC TALENT, Charles C. Cole, Jr., 259 pp., $3.50, College Entrance Examination Board, P. O. Box 592, Princeton, New Jersey, 1956.

Starting with a definition of the sciences and the characteristics of scientists, this book goes on to describe the ways in which scientific ability may be identified, the present and future need for engineers and scientists, and the large numbers of potential scientists and engineers who for various reasons do not attend college. The factors which deter the development of scientists —individual qualities, family and community conditions, social influences—are appraised and weighed against those forces which could increase their number.

This book is the product of a careful survey and research project which combines a critical review of all existing literature in this field with a nation-wide study of high school students and their plans.

A Visual Device in the Teaching of Mitosis

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The process of mitosis is often difficult to illustrate in the classroom. The most commonly used visual device is the chalkboard, whose shortcomings are well-known. If a series of drawings are made to illustrate the various stages, pupils often become confused and fail to relate parts of a drawing with the same parts in another drawing of the series.

To overcome this and other problems involved in chalk drawings, the flannelboard might be employed. This gives a continuous moving picture of the process. Instead of trying to interpret a series of pictures, the pupil can see the entire story unfold in one picture. The teacher can control the demonstration easily, altering the speed to fill the needs of the pupils, or reverting to previous parts which might have been missed. It helps increase the attention of the pupils. Keeping the device in the room for several days, enabling the pupil to manipulate the device himself, is very helpful for a review.

The preparation of the material is simple. A standard flannelboard may be used, or one may be improvised by stretching a large piece of flannel, fuzzy side out, over a plywood board. Felt can be used in the same way. The characters to be used are easily constructed. The teacher need not confine himself to the characters used here, but might try new and different ideas.

The characters can be made from colored construction paper. For example, the one member of each pair of chromosomes could be made yellow, the other brown. The characters may adhere to the flannel without any special assistance. If they do not, commercial backing materials may be applied,[1] or little strips of sandpaper may be glued to the back of the characters.

Here is how these characters can be used. First, a piece of string is placed in a broad ellipse on the board to represent the cell membrane. The string should start and stop at the bottom and should have a leftover piece at one end. A large solid piece, representing the nucleus is placed inside the cell membrane. A few fanciful lines may be drawn on this piece to indicate the chromatin. A smaller solid circle represents the centrosome and is placed near the nucleus. A small central circle should be drawn in the center of this piece to represent the actual centrosome, and lines emanating from it represent its rays. We now have a picture of the metabolic or resting stage as shown in Figure 1. The demonstration should already be set up as is pictured when class is begun.

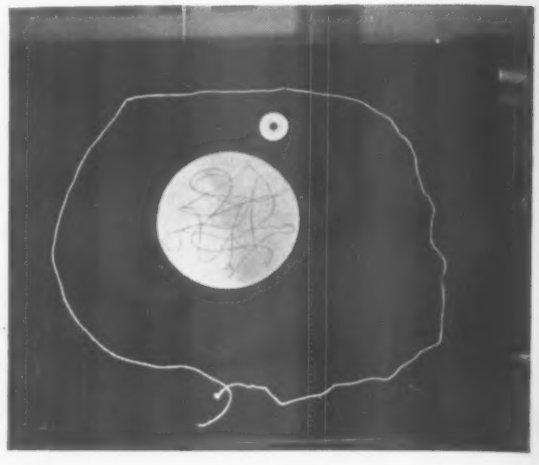

FIGURE 1.

Prophase is initiated by the splitting of the centrosomes. The second centrosome piece is introduced and they are begun to be separated toward the poles. The chromatin shapes itself into the chromosomes in prophase. The nucleus piece should be removed to indicate parts already placed beneath. The nuclear membrane surrounds three pair of chromosomes. To have enough chromosomes without overcrowding three pairs were chosen, a small round pair, a cane-shaped pair, and a long

[1] A special backing for flannelboard characters is sold by Florey, Inc., 815 Bates, Detroit 26, Michigan under the name FLOK-TITE.

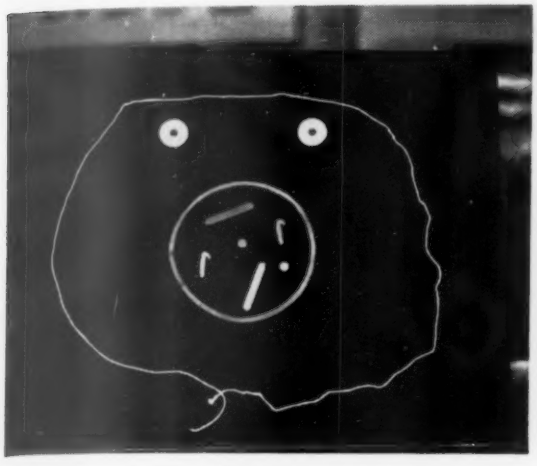

FIGURE 2.

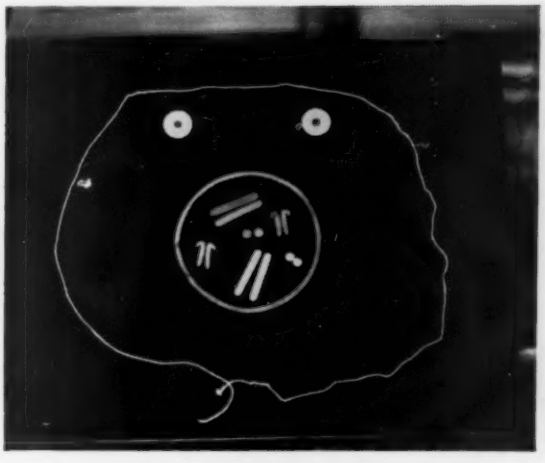

FIGURE 3.

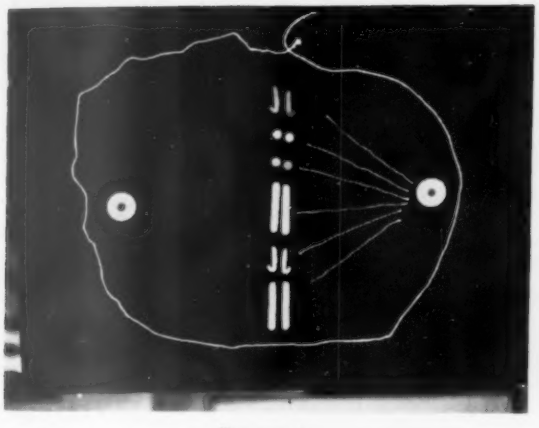

FIGURE 4.

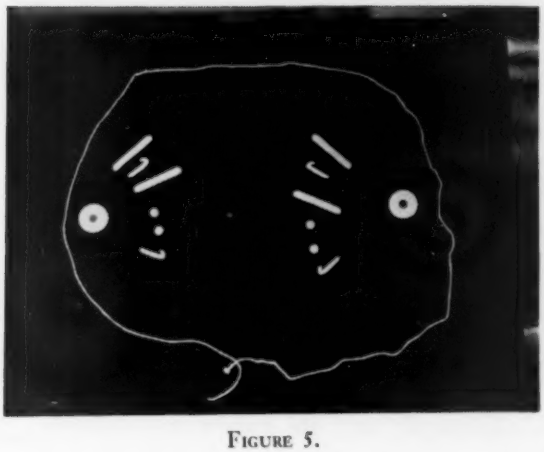

FIGURE 5.

thin pair. One member of each pair is colored one color; the other member, another. This helps later in distinguishing chromatids from chromosomes. Prophase thus far is indicated in Figure 2.

The chromosomes' duplicating themselves in late prophase is shown by placing additional identical characters against each. Figure 3 shows how these chromatids would appear. Later in prophase, or some consider it early in metaphase, the nuclear membrane disappears. It is simply removed from the board.

When the chromatids are paired along the equatorial plate in metaphase (Figure 4), the teacher should attempt an unsymmetrical arrangement. The spindle fibers may be indicated by pieces of thin string. Since the spindle fibers take time to put in place and are the same on both sides, they may only be placed on one side and the pupils' imaginations called into action for the other.

Anaphase (Figure 5) introduces no new characters; it is just a manipulation stage. The chromatids are moved toward opposite centrosomes and the spindle fibers then disappear.

The center of the string at the top and bottom may be moved inward to indicate the pinching off of the cell membrane in telophase. This however, is a delicate maneuver which may cause the entire string to fall off. It is best to leave this to the imaginations of the pupils, also. What can be indicated for telophase, as is seen in Figure 6, is the reappearance of the nuclear membranes, now two in number and surrounding each group of chromosomes.

The return to the metabolic stage (Figure 7) is first shown by the completion of the new cell membrane between the two halves. This is

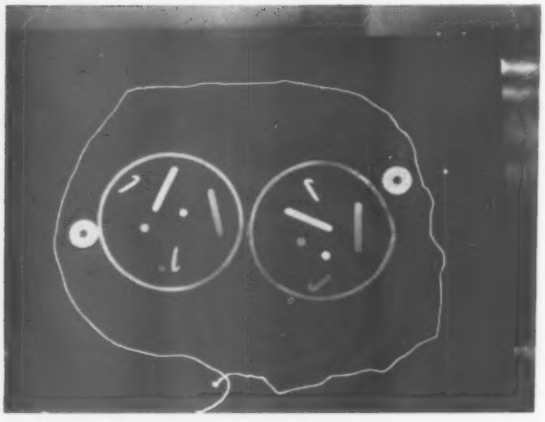

FIGURE 6.

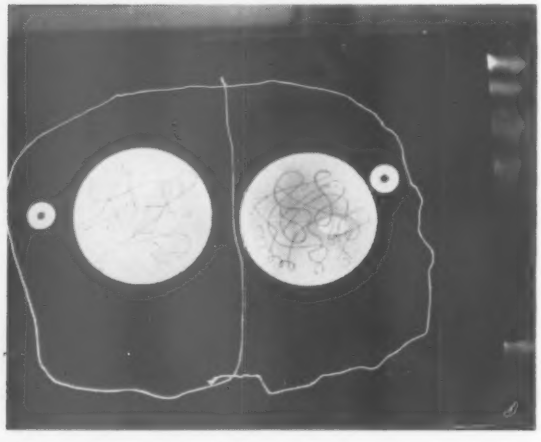

FIGURE 7.

shown by running the leftover piece of string at one end through the middle from bottom to top. The unwinding of the chromsomes may be indicated by placing a nucleus piece over each side.

This equipment may also be used to show the reduction division in meiosis. The difference here is that the chromosomes do not duplicate themselves in prophase, and the partner chromosomes line up together in metaphase.

This indicates one way in which the flannelboard may be used in biology classes. This much overlooked piece of equipment should lend itself to other areas, where many complex interrelationships occur. Perhaps teachers can devise ways to use the flannelboard to show such things as ecological relations or genetic crosses, and bring this important piece of visual equipment into prominence in the secondary school room.

National Association of Biology Teachers

ANNUAL MEETING
DEC. 26-30, 1956
New York City

Wednesday, December 26

6:30 p.m. Meeting of Board of Directors, Sheraton-McAlpin, Room 363

8:00 p.m. Mixer, jointly NSTA and ANSS, Sheraton-McAlpin, Ballroom

Thursday, December 27

9:00 a.m. General session of NABT, JOHN BREUKELMIAN, President-elect of NABT, presiding. Sheraton-McAlpin, Colonial Room

1. Leadership Patterns in State Conservation Education Programs, RICHARD L. WEAVER, University of Michigan, Ann Arbor.
2. Progress Report on NABT Conferences on Biology Teaching, GEORGE W. JEFFERS, Longwood College, Farmville, Virginia.
3. Biology of the Upper Atmosphere, HERMAN SHAEFFER, School of Aviation Medicine, Naval Air Station, Pensacola, Florida.
4. Use of Insect Material in High School Biology: Heart Beat of Cockroach, EDWIN R. TEFFT, Fordham University, New York, N. Y.
5. Experiences of a High School Biology Counsellor, J. DAVID LOCKARD, Pennsylvania State University, University Park, Pennsylvania.

Afternoon: AAAS meeting on the Frontiers of Biological Science

Evening: Joint session with ANSS and NSTA followed by Q1-AAAS Cooperative Committee's discussion. Sheraton-McAlpin, Ballroom.

Friday, December 28

8:00 a.m. Editorial Board Meeting. Sheraton-McAlpin, Room 363

12:30 p.m. NABT luncheon. Sheraton-Mc-

Alpin, Colonial Room, JOHN P. HARROLD, President, NABT, presiding.
Installation of officers

Address—Nuclear Research and Development: Implications for American Education, by ROGER L. LEATHERMAN, University of Michigan, Ann Arbor.

3:00 p.m. Guided tour, "Behind the Scenes at the American Museum."

Saturday, December 29

9:00 a.m. General Program on Methods and Techniques.

Section A. High School; JOHN BREUKELMAN presiding, Sheraton-McAlpin, Colonial Room

1. Interest-Getting Devices, IRENE HOLLENBECK, Southern Oregon College of Education, Ashland, Oregon
2. Techniques in Biology, presented by New York Biology Teachers Association CHARLES TANZER, Seward Park High School, New York 2, N. Y., assisted by CHARLES ROBINSON and ROBERT WEINBERGER, New York Biology Teachers Association

9:00 a.m. Section B. Elementary; HOWARD WEAVER, Vice-president, NABT, presiding, Sheraton-McAlpin, Room 363.

9:00-10:30 a.m.

Elementary Science Workshop, "Do-it-yourself," under direction of HARRY MILGRIM, Elementary School Science Coordinator, New York City.

10:30 a.m.-12:00 noon

1. Nutrition Experiments with Young Children, ROBERT WICKWARE, State Teachers College, Willimantic, Connecticut.
2. American Museum of Natural History for Elementary Children, HARRY MILGRIM.

2:00 p.m. General Program on Urban Conservation, IRENE HOLLENBECK presiding, Sheraton-McAlpin, Room 363.

1. Urban Conservation, E. L. PALMER, Director, Conservation Education, National Wildlife Federation.
2. Lots for Urban Biology, PHYLLIS BUSCH, 956 E. 18th St., Brooklyn, New York. (Lantern)
3. Community Service by a Biology Club, RICHARD LAPE, Amherst High School, Snyder, New York.
4. Establishing a Plant and Wildlife Area in a City, IRVING KEENE, Brookline High School, Brookline, Massachusetts (Lantern).
5. Radioisotopes for Human Conservation, FRANCIS RUZIZKA, Radiology Department, St. Vincent's Hospital, New York City.

8:30 p.m. AAAS Smoker

Sunday, December 30

9:00 a.m. Field trip, jointly with ANSS
Chairman, CHARLES E. MOHR

Visit to the New Stamford, Connecticut, Museum and Nature Center, the Mianus River Gorge, and the Audubon Nature Center, Greenwich, Connecticut.

Leaders: GLORIA HOLLISTER ANABLE, LEONARD J. BRADLEY, ERNEST T. LUHDE, CHARLES E. MOHR, ROGER TORY PETERSON, DOROTHY A. TREAT AND RICHARD L. WEAVER.

Tickets and travel instructions will be available at the science teaching societies registration tables in the Sheraton-McAlpin Hotel.

Reserve a Place at the N.A.B.T. Luncheon

Speaker: Roger L. Leatherman, University of Michigan, Coordinator of more than 130 projects devoted to research on peacetime uses of atomic energy.

Topic: "Nuclear Research and Development Implications for American Education."

Place: Sheraton-McAlpin Hotel, 12:30 P.M., December 28, 1956.

I expect to attend the N.A.B.T. luncheon. Check for $5 is enclosed ( )

I expect to attend the N.A.B.T. luncheon and shall mail check for $5.00 before Dec. 1, 1956 ( )

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Send Checks to Miss T. Margaret Jamer, Chairman
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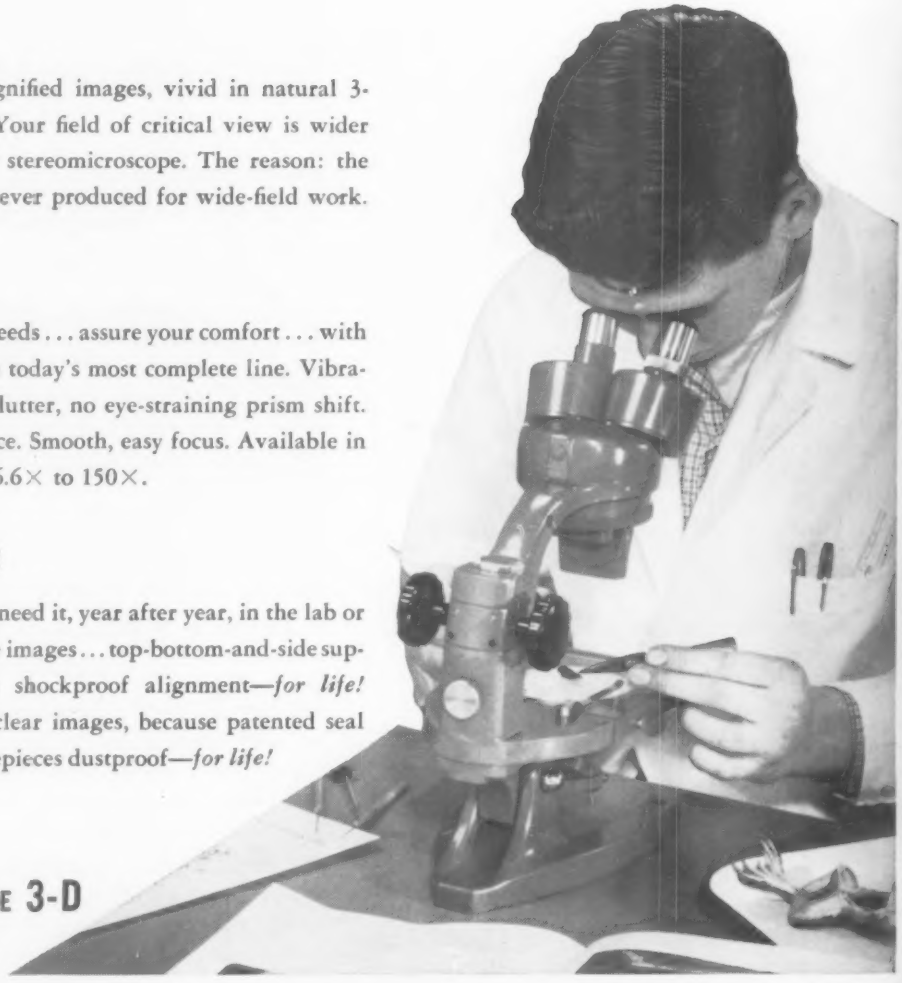

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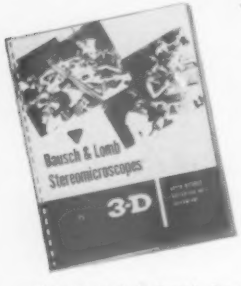

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